

What is Claimed is:

1. A method for forming a membrane comprising the steps of:
- 5 bringing into contact a coating of membrane material on a substrate and a support member; and
- 10 curing the membrane material so as to form the membrane and to bond the support member to the membrane, wherein, when bonded to the membrane, the support member, having a rigidity which is greater than the membrane, maintains at least a portion of the membrane in a substantially taut condition to prevent a portion of the membrane from folding onto itself.
2. The method according to claim 1, further comprising the step of, prior to the
- 15 positioning of the support member on the membrane material, treating at least a bonding portion of a surface of the support member which will contact the membrane material to increase the bonding between the support member and the membrane material.
3. The method according to claim 2, wherein the treating step comprises
- 20 applying a primer to the bonding portion.

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4. The method according to claim 3, wherein the primer comprises polydimethylsiloxane.

5. The method according to claim 1, wherein the membrane material is a polymer.

6. The method according to claim 1, wherein the membrane material comprises polydimethylsiloxane.

10 7. The method according to claim 2, wherein the treating step comprises exposing the support member to a plasma.

8. The method according to claim 7, wherein the plasma is an oxygen plasma.

15 9. The method according to claim 1, wherein the membrane includes through-holes.

10. The method according to claim 9, further comprising the step of adding additional material into the through-holes.

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11. The method according to claim 1, wherein the support member extends around an entire perimeter of the membrane and has a height which is greater than a height of a top surface of the membrane, so that the support member and the membrane form a well.

5 12. The method according to claim 11, further comprising the step of adding additional material into the well.

13. The method according to claim 1, wherein the step of bringing into contact a coating of membrane material and a support member includes bringing into contact an outer
10 perimeter of the coating of membrane material and the support member.

14. A method for applying a pattern to a target surface, the method comprising the steps of:

15 applying a coating of membrane material over a selected portion of a substrate, the substrate imparting the pattern to the membrane material;

positioning a support member in contact with an outer perimeter of the membrane material;

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curing the membrane material to bond the support member to the membrane, wherein, when bonded to the membrane, the support member, which has a rigidity which is greater than the membrane, maintains at least a portion of the membrane in a substantially taut condition to prevent that portion of the membrane from folding onto itself;

5 removing the membrane from the substrate; and

employing the membrane to apply the pattern to the target surface.

10 15. The method according to claim 14, wherein the substrate includes a plurality of features thereon corresponding to the first pattern, the features including one of depressions and projections.

15 16. The method according to claim 14, further comprising the step of, prior to employing the membrane to impart the final pattern to the target surface, separating the membrane from the support member.

17. The method according to claim 14, wherein the step of removing the membrane from the substrate includes using the support member to remove the membrane from the substrate.

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18. The method according to claim 14, wherein the support member extends around an entire perimeter of the membrane membrane and has a height which is greater than a height of a top surface of the membrane, so as to form a well, and wherein the method further comprises the step of, prior to employing the membrane to impart the pattern to the target surface, adding additional material into the well.

19. The method according to claim 18, further comprising the step of, prior to adding the additional material into the well, applying a second pattern to a surface of the membrane within the well.

20. The method according to claim 18, wherein the second pattern includes at least one of depressions and projections.

21. The method according to claim 14, wherein the membrane includes through-holes, and wherein the method further comprises the step of adding the additional material into the through-holes.

22. A method for handling a membrane, the method comprising the steps of:
at a first location, attaching a support member to the membrane, the support member having a rigidity which is greater than the rigidity of the membrane; and

transferring the support member and the membrane from the first location to a second location.

23. The method of claim 22, wherein the first location comprises a substrate.

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24. The method of claim 23, wherein the substrate has at least one feature.

25. The method of claim 24, wherein the substrate has a plurality of the features forming a pattern for creating a corresponding pattern of through-holes in the membrane.

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26. The method of claim 25, wherein the pattern of features has an outer perimeter, and the support member has an inner perimeter which, when the support member is attached to the membrane, is outside the outer perimeter of the features.

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27. The method of claim 22, wherein the membrane is elastomeric.

28. The method of claim 27, wherein the elastomeric membrane comprises poly(dimethylsiloxane).

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29. The method of claim 28, wherein the step of attaching comprises the steps of: applying a bonding material to a surface of the transfer frame;

positioning the transfer frame so that a surface of the transfer frame is in contact with the membrane; and
curing the bonding material.

5 30. The method of claim 29, wherein the bonding material comprises PDMS.

31. The method of claim 29, further comprising the step of, prior to attaching the support member to the membrane, treating a bonding portion of a surface of the support member.

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32. The method of claim 31, wherein the treating step comprises exposing the support member to a plasma.

33. The method of claim 32, wherein the plasma is an oxygen plasma.

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34. The method of claim 28, wherein the step of attaching comprises the steps of:
when the membrane is in an un-cured state, positioning the transfer frame so that a surface of the transfer frame is in contact with the membrane;
curing the membrane.

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35. The method of claim 34, further comprising the step of, prior to attaching the support member to the membrane, treating a bonding portion of a surface of the support member.

5 36. The method of claim 35, wherein the treating step comprises exposing the support member to a plasma.

37. The method of claim 36, wherein the plasma is an oxygen plasma.

10 38. The method of claim 22, wherein the step of transferring the support member and the membrane from the first location to a second location includes the step of separating the membrane from the substrate.

15 39. The method of claim 22, further comprising the step of, at the second location, detaching the support member from the membrane.

40. The method of claim 25, wherein the second location is a target surface, and wherein the method further comprises the step of processing the membrane on the target surface so that features corresponding to the through-holes of the membrane are formed on
20 the target surface.

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41. The method of claim 22, wherein the support member functions as a container.

42. The method of claim 41, wherein the method further comprises the step of
5 applying an elastomeric material to a top surface of the membrane.

43. The method of claim 42, further comprising the step of, before applying the elastomeric material, disposing at least one feature on the top surface of the membrane.